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DECLARATION

Technology Center 2600

I, Kazuo O'oka of c/o SHIGA INTERNATIONAL PATENT
OFFICE, 2-3-1 Yaesu, Chuo-ku, Tokyo, Japan, understand both English
and Japanese, am the translator of the English document attached, and do
hereby declare and state that the attached English document contains an
accurate translation of Japanese Patent Application No. 2001-008712 and
that all statements made herein are true to the best of my knowledge.

Declared in Tokyo, Japan

This 13th day of May, 2004

Kazuo Ooka
Kazuo O'oka

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(Inventor)	
(Address)	c/o Seiko Epson Corporation, 3-5, Owa 3-chome, Suwa-shi, Nagano-ken
(Name)	UCHIDA Masahiro
(Applicant for Patent)	
(Identification Number)	000002369
(Name)	Seiko Epson Corporation
(Agent)	
(Identification Number)	100093388
(Patent Attorney)	
(Name)	SUZUKI KIsaburo
(Telephone Number)	0266-52-3139
(Elected Agent)	
(Identification Number)	100095728
(Patent Attorney)	
(Name)	KAMTYANAGI Masataka
(Elected Agent)	

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(Patent Attorney)

(Name) SUZAWA Osamu

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[Title of the Invention] Electronic Device Providing an Organic Electro-luminescent Display Apparatus

[Claims]

[Claim 1]

An electronic device providing a display apparatus characterized in comprising an organic electro-luminescence display apparatus formed by an organic electro-luminescent element having at least one photoluminescent organic thin film is interposed between an anode thin film and a cathode thin film, and a liquid crystal display apparatus.

[Claim 2]

An electronic device according to claim 1 characterized in that said electronic device is a mobile terminal for a portable telephone or the like.

[Claim 3]

An electronic device according to either claim 1 or claim 2 characterized in that when not in-use or during stand-by, said organic electro-luminescent display apparatus is in a non-display state, and only said liquid crystal display apparatus is in a display state.

[Claim 4]

An electronic device according to any of claims 1 through 3 characterized in that the driver method of said organic electro-luminescent display apparatus is an active matrix driver.

[Claim 5]

An electronic apparatus according to any of claims 1 through 4 characterized in that said liquid crystal display apparatus is a semitransparent reflecting type liquid crystal display apparatus.

[Claim 6]

An electronic apparatus according to any of claims 1 through 5 characterized in that said liquid crystal display apparatus is a reflecting type liquid crystal display

apparatus.

[Claim 7]

An electronic apparatus according to any of claims 1 through 6 characterized in that the driver method of said liquid crystal display apparatus is a simple matrix driver.

[Claim 8]

An electronic apparatus according to any of claims 1 through 7 characterized in that the driver method for said liquid display apparatus is an active matrix driver.

[Claim 9]

An electronic apparatus according to any of claims 1 through 8 characterized in that said liquid crystal display apparatus is a monochrome display.

[Claim 10]

An electronic apparatus according to any of claims 1 through 9 characterized in that said liquid crystal display apparatus is a full color display.

[Claim 11]

An electronic apparatus according to any of claims 1 through 10 characterized in that an organic EL light source is used for illumination of said liquid crystal display apparatus.

[Claim 12]

An electronic apparatus according to any of claims 1 through 11 characterized in comprising a switching mechanism that switches the display between said liquid crystal display apparatus and said organic electro-luminescent display apparatus.

[Claim 13]

An electronic apparatus according to any of claims 1 through 12 characterized in comprising a mechanism that stops the display of said organic electro-luminescent display apparatus and automatically switches the display to said liquid crystal display apparatus when the remaining charge of the battery provided in said electronic apparatus

reaches a predetermined remaining charge.

[Claim 14]

An electronic apparatus according to any of claims 1 through 12 characterized comprising a mechanism in the electronic device that can automatically switch the display to the liquid crystal display apparatus when the unused interval continues for a certain time period while the organic EL display apparatus is driven.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to an electronic device providing an organic electro-luminescent (below, electro-luminescent is abbreviated "EL") display apparatus and a liquid crystal display apparatus.

[0002]

[Conventional Technology]

Compared to a liquid crystal display apparatus, the organic EL display apparatus has many advantageous properties as a display, such as high response speed, wide directionality, the good viewing characteristics properties of natural light emitting elements, and in addition, has a wide operating temperature range. Therefore, presently in numerous electronic devices that require a display, the use of organic EL display apparatuses is being studied.

[0003]

Japanese Unexamined Patent Application, First Publication, No. Hei 12-105573 is a conventional technology using an organic EL display apparatus in the display apparatus of an electronic device. This publication discloses a technology in which an organic EL display apparatus is used in electronic devices such as portable terminal devices, and when the device is not in use or in the case of the portable terminal device, when the device is on stand-by, only the minimal necessary information is displayed.

[0004]

[Problems solved by the present invention]

However, in the conventional technology described above, even if only the minimal necessary information is displayed when the device is not in use or in the case

of the portable terminal device, when the device is on stand-by, a firm current must continuously flow in order to drive the organic EL display apparatus. The energy consumption for driving the organic EL display apparatus is larger than that for a reflecting-type or translucent type liquid crystal display apparatus, and thus the when the electronic device having an organic EL display apparatus is not in use, and in particular, when a mobile terminal such as a portable telephone is on stand-by, the battery consumption is severe.

[0005]

In consideration of the problem described above, it is an object of the present invention to reduce the power consumption when an electrical device having an organic EL display apparatus mounted is not in use or, in the case of a mobile terminal such as a portable telephone, is on stand-by.

[0006]

[Means for solving the problems]

According to claim 1 of the electro device, an organic EL display apparatus comprising organic EL elements in which a phosphorescent organic thin layer is formed on at least one surface of a board by being interposed between a positive electrode thin film and a negative electrode thin film, and a liquid crystal display apparatus are provided in an electronic device providing a display apparatus.

[0007]

According to this structure, because the organic EL display apparatus, which has a high energy consumption but allows superior image displays or video displays, and a liquid crystal display apparatus, which can display information at a low energy consumption, are used depending on necessity, low energy consumption of an electronic device having mounted an organic EL display apparatus can be implemented.

[0008]

According to claim 2 of the electro device, the electronic device of the first aspect is a mobile terminal such as a portable telephone.

According to this structure, in a mobile terminal such as a portable telephone whose battery capacity is limited, there is the effect that use for a long time interval is possible by using the organic EL display apparatus and the liquid crystal display apparatus as necessary.

[0009]

According to claim 3 of the electro device, in an electronic device according to any of the first through third aspects, while not in use or during stand-by, the organic EL display apparatus is in a non-display state, and only the liquid crystal display apparatus is in the display state.

[0010]

According to this structure, in an electronic device that must display any sort of information while not in use, and in particular, in a mobile terminal such as a portable telephone that must display the time or the like even while on stand-by, there is the effect that the consumption of power is greatly reduced by not driving the organic EL display apparatus while not in use or during stand-by.

[0011]

According to claim 4 of the electro device, in an electronic device according to any of the first through third aspects, the driver method of the organic EL display apparatus is an active matrix driver.

[0012]

According to this structure, by making the driver format of the organic EL display apparatus an active matrix driver driven by an low temperature polysilicon TFT, low energy consumption is possible, the service life of the organic EL elements can be increased, and furthermore, images and video having superior visibility can be provided.

[0013]

According to claim 5 of the electro device, in the electronic device according to any of the first through fourth claims, the liquid crystal display apparatus is a translucent reflecting type liquid crystal display apparatus.

[0014]

According to this structure, because the liquid crystal display apparatus is a translucent reflecting type liquid crystal display apparatus, because illumination such as a backlight is necessary at the light location.

[0015]

According to claim 6 of the electro device, in an electronic device according to any of the first through fifth aspects, the liquid crystal display apparatus is a reflecting type liquid crystal display apparatus.

[0016]

According to this structure, because the liquid crystal display apparatus is a

reflecting type liquid crystal display apparatus, at a light location, illumination such as a backlight is required, and thus even at a dark location, because a front light is used, a very bright illumination is not necessary, and thus low energy consumption is possible. Furthermore, by using a front light instead of a back light, the liquid crystal display apparatus can be made thin.

[0017]

According to claim 7 of the electro device, in an electronic device according to any of the first through sixth aspects, the driver method of the liquid crystal display apparatus is a simple matrix driver.

[0018]

According to this structure, because the driver method of the liquid crystal display apparatus is a simple matrix driver, the liquid crystal display apparatus can be provided at low cost.

[0019]

According to claim 8 of the electro device, in the electric device according to any of the first through seventh aspects, the driver method of the liquid crystal display apparatus is an active matrix driver.

[0020]

According to this structure, because the driver method of the liquid crystal display apparatus is an active matrix driver, the image display capacity of the liquid crystal display apparatus can be increased, and thereby advanced appropriate use of the organic EL display apparatus and the liquid crystal display apparatus that depends on the type of the information, such as video or still image, the remaining battery capacity, the presence or absence of an electrical charging apparatus, or the like, is possible.

[0021]

According to claim 9 of the electro device, in the electric device according to any of the first through the eighth aspects, the liquid crystal display apparatus is a monochrome display.

[0022]

According to this structure, because the liquid crystal display apparatus is a monochrome display, the liquid crystal display apparatus can be provided at low cost.

[0023]

According to claim 10 of the electro device, in an electric device according to

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any of the first through ninth aspects, the liquid crystal display is a full color display.

[0024]

According to this structure, because the liquid crystal display is a full color display, the image display capacity of liquid crystal display apparatus can be increased, and thereby advanced appropriate use of the organic EL display apparatus and the liquid crystal display apparatus that depends on the type of the information, such as video or still image, the remaining battery capacity, the presence or absence of an electrical charging apparatus, or the like, is possible.

[0025]

According to claim 11 of the electro device, in an electric device according to any of the first through tenth aspects, an organic EL light source is used as the illumination for the liquid crystal display apparatus.

[0026]

According to this structure, because an organic EL light source is used as the illumination for the liquid crystal display apparatus, there is no variation in the light, a display having superior visibility can be provided, and the energy consumption can be severely reduced.

[0027]

According to claim 12 of the electro device, in an electric device according to any of the first through eleventh aspects, a mechanism for switching the display of the liquid crystal display apparatus and the organic EL display apparatus is provided.

[0028]

According to this structure, because a mechanism for switching the display of the liquid crystal display apparatus and the organic EL display apparatus is provided, advanced appropriate use of the organic EL display apparatus and the liquid crystal display apparatus that depends on the type of the information, such as video or still image, the remaining battery capacity, the presence or absence of an electrical charging apparatus, or the like, is possible.

[0029]

According to claim 13 of the electro device, in an electronic device according to any of the first through twelfth aspects, a mechanism is provided in the electric device that suspends the display of the organic EL display apparatus at the point in time that the remaining battery charge becomes a predetermined remaining charge, and automatically

switches to the display of the liquid crystal display apparatus.

[0030]

According to this structure, the use time of the electronic device driven by a battery having a certain capacity can be lengthened by limiting the driver of the organic EL display apparatus, which has a high energy consumption compared to the translucent type and reflecting type liquid crystal display apparatuses.

[0031]

According to claim 14 of the electro device, in an electric device according to any of the first through thirteenth aspects, a mechanism is provided in the electronic device that can automatically switch the display to the liquid crystal display apparatus when the unused interval continues for a certain time period in the state in which the organic EL display apparatus is driven.

[0032]

According to this structure, the use time of the electronic device driven by a battery having a certain capacity can be lengthened by limiting the use of the organic EL display apparatus while the electric device is not used.

[0033]

[Embodiments of the Invention]

(First Embodiment)

Below, a first embodiment of the present invention will be explained while referring to the figures. Fig. 1 is a schematic drawing of the mobile terminal electronic device of the present embodiment. Fig. 2 is a schematic drawing of the mobile terminal electronic device of the present embodiment shown in a folded state.

[0034]

The mobile terminal electronic device in the present embodiment comprises a an organic EL display apparatus 102 that is a full color active matrix display having an active matrix driver, and a translucent reflecting type liquid crystal display apparatus 103 for monochrome display by a simple matrix driver.

[0035]

In the organic EL display apparatus 102 in the present embodiment, organic EL elements for red, green, and blue are each patterned on the low temperature polysilicone TFT substrate, and along with the driver circuit board, are disposed as essential display parts of the mobile terminal electronic device. A full color display is possible because

the three red, green, and blue organic EL elements are respectively patterned in each pixel. There are no particular limitations on the resolution and gradation of the organic EL display apparatus, but to make possible a high definition, smooth, moving display, a resolution of QVGA or higher having 320 x 200 pixels and 16 or more gradations for each color is preferable.

[0036]

The patterning method of the organic EL elements is not particularly limited, but the method in which low molecular weight organic materials that emit each of the colors are deposited using a mask under a high vacuum and a method in which high molecular weight compounds that emit each color are made into an ink by being melted into a solvent and patterned by an ink jet method are possible.

[0037]

The liquid crystal display apparatus 103 in the present embodiment is for a translucent type, and thus an inorganic LED back light is used as illumination. However, the embodiment is not limited thereby, and organic EL elements may be used for illumination.

[0038]

In addition, the liquid crystal display apparatus 103 in the present embodiment is a translucent type, but is not limited thereby. A reflecting type liquid crystal display apparatus can be used, and a front light used for illumination.

[0039]

The mobile terminal electronic device according to the first embodiment is a folding type, and in the folded state shown in Fig. 2, the organic EL display apparatus 102 can be automatically turned OFF, and during the stand-by time, the translucent reflecting type liquid crystal display apparatus 103 displays only the necessary minimal information. Therefore, the power consumption during the stand-by time is only the power necessary to drive the liquid crystal display apparatus 103.

[0040]

In addition, while the power of the body is ON, when the mobile terminal electronic device according to the present embodiment is opened as shown in Fig. 1 from the folded state shown in Fig. 2, the power of the organic EL display apparatus 102 can be automatically turned ON.

[0041]

In addition, when a mechanism that stores information before the power of the organic EL display apparatus 102 is provided on the mobile terminal electronic device of the present embodiment and the power of the organic EL display apparatus 102 is turned back ON, the information immediately prior to being turned OFF can be displayed.

[0042]

(Second Embodiment)

Below, the second embodiment of the present invention will be explained with reference to the figures. Fig. 3 is a schematic diagram of the mobile terminal electronic device of the present embodiment, and Fig. 4 is a schematic diagram of the folding mobile terminal electronic device of the present embodiment.

[0043]

The mobile terminal electronic device of the present embodiment has built in an organic EL display apparatus 202 having a full color active matrix display, and a translucent reflecting-type liquid crystal display apparatus 203 that is a full color active matrix display.

[0044]

The organic EL display apparatus 202 of the present embodiment is similar to that in the first embodiment.

[0045]

The liquid crystal display apparatus 203 in the present embodiment is an active matrix driven by a low temperature polysilicon TFT, but is not limited thereby, and it can also be driven by an amorphous silicon TFT or the like.

[0046]

In addition, the liquid crystal display apparatus 203 in the present embodiment is a translucent type and carries out full color display, and thus an organic LED white light-emitting backlight is used for illumination. However, the embodiment is not limited thereby, and a white light emitting organic EL element can also be used as illumination.

[0047]

In addition, the liquid crystal display apparatus 203 of the present embodiment is a translucent type, but is not limited thereby, and a reflecting type liquid crystal display apparatus may be used, or a white-light front light can be used as illumination.

[0048]

The mobile terminal electronic device in the present embodiment provides a switch 204 that switches the display between the organic EL display apparatus 202 and the liquid crystal display apparatus 203, and thus it is possible to determined the appropriate use depending on the type of information, such as video or static image, and the condition of the remaining capacity of the battery, or whether or not there is a battery charge apparatus. Moreover, the setting position of the switch 204 is not limited by the present embodiment.

[0049]

In addition, there is a switching mechanism that, when the remaining battery charge becomes low, suspends the display of the organic EL display apparatus, which has a high-energy consumption level, at an arbitrary point in time, and can manually be switched to the display of the liquid crystal display apparatus. In addition, when the organic EL display apparatus is activated, if an unused state continues, the display can be automatically switched to the liquid crystal display apparatus.

[0050]

The mobile terminal electronic device according to the present embodiment can select the display during stand-by between the display by the organic EL display apparatus and the display by the liquid crystal display apparatus.

[0051]

In this folding-type mobile terminal electronic device shown in Fig. 4, like the first embodiment, the power of the organic EL display apparatus 202 and the liquid crystal display apparatus 203 are turned OFF when in the folded state. In addition, when the power of the body is ON, when opened from the folded state, the power of the organic EL display apparatus 102 automatically turns ON.

[0052]

[Effects of the Invention]

As explained above, an electronic device having a display apparatus, and in particular in a mobile terminal electronic device such as a portable telephone that saves on energy consumption, by providing both an organic EL display apparatus whose viewing characteristics have superior fineness and a translucent or reflecting-type liquid crystal display apparatus that can keep the power consumption low and assigning use, an electronic device having an organic EL display apparatus built in can be efficiently used at a low power consumption.

[Brief description of the drawings]

[Fig. 1] Fig. 1 is a schematic drawing of an electronic device of the present invention.

[Fig. 2] Fig. 2 is a schematic drawing of an electronic device of the present invention.

[Fig. 3] Fig. 3 is a schematic drawing of the electronic device of the present invention.

[Fig. 4] Fig. 4 is a schematic drawing of the electronic device of the present invention.

[Brief Explanation of the symbols]

- 101 mobile terminal electronic apparatus
- 102 organic EL display apparatus
- 103 liquid crystal display apparatus
- 201 mobile electronic apparatus
- 202 organic EL display apparatus
- 203 liquid crystal display apparatus
- 204 switching mechanism

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[Document Type] Abstract

[Abstract]

[Problem to be Solved]

The invention provides an electronic device comprising an organic electro-luminescent display apparatus and a liquid crystal display apparatus.

[Means for Solving the Problem]

In an electronic device requiring a display apparatus, and in particular, in a mobile terminal electronic device 201 such as a portable telephone that must restrict power consumption, by providing both an organic EL display apparatus 202 whose viewing characteristics have superior fineness and a translucent or reflecting-type liquid crystal display apparatus 203 that can keep the power consumption low and assigning use, an electronic device having an organic EL display apparatus built in can be efficiently used at a low power consumption, and at the same time the use of the display apparatuses can be assigned depending on the type of information, such as video or static image, the remaining charge of the battery, or the like.

[Elected Drawing] Fig. 4



FIG. 1

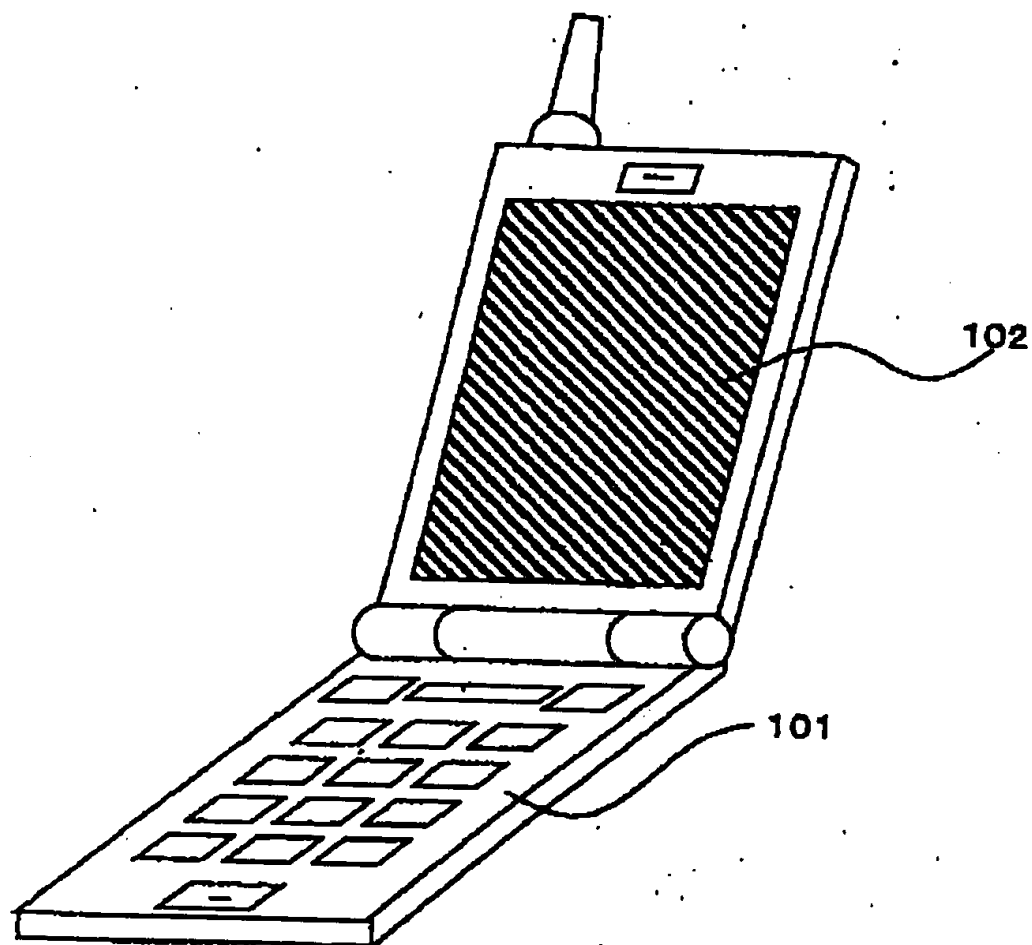
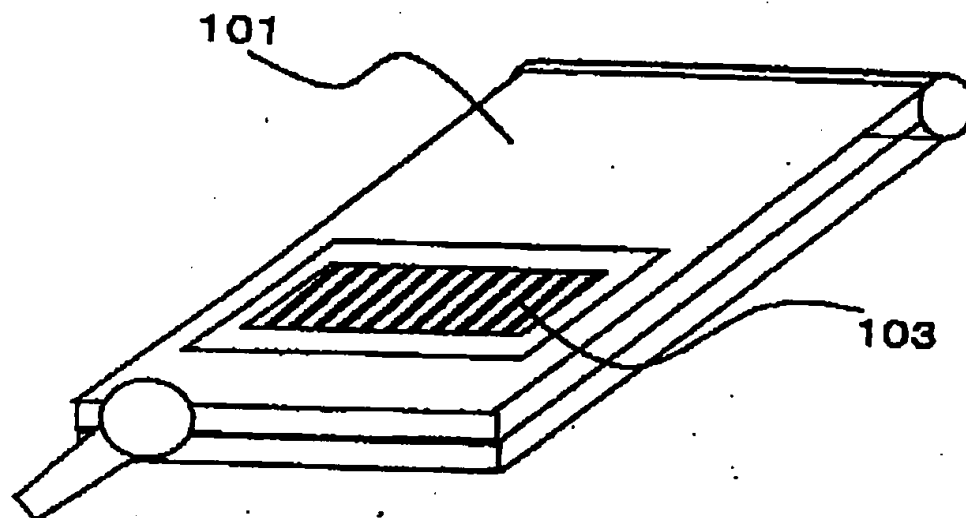




FIG. 2



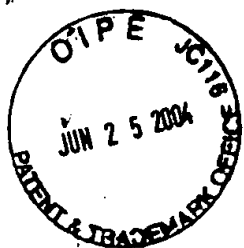


FIG. 3

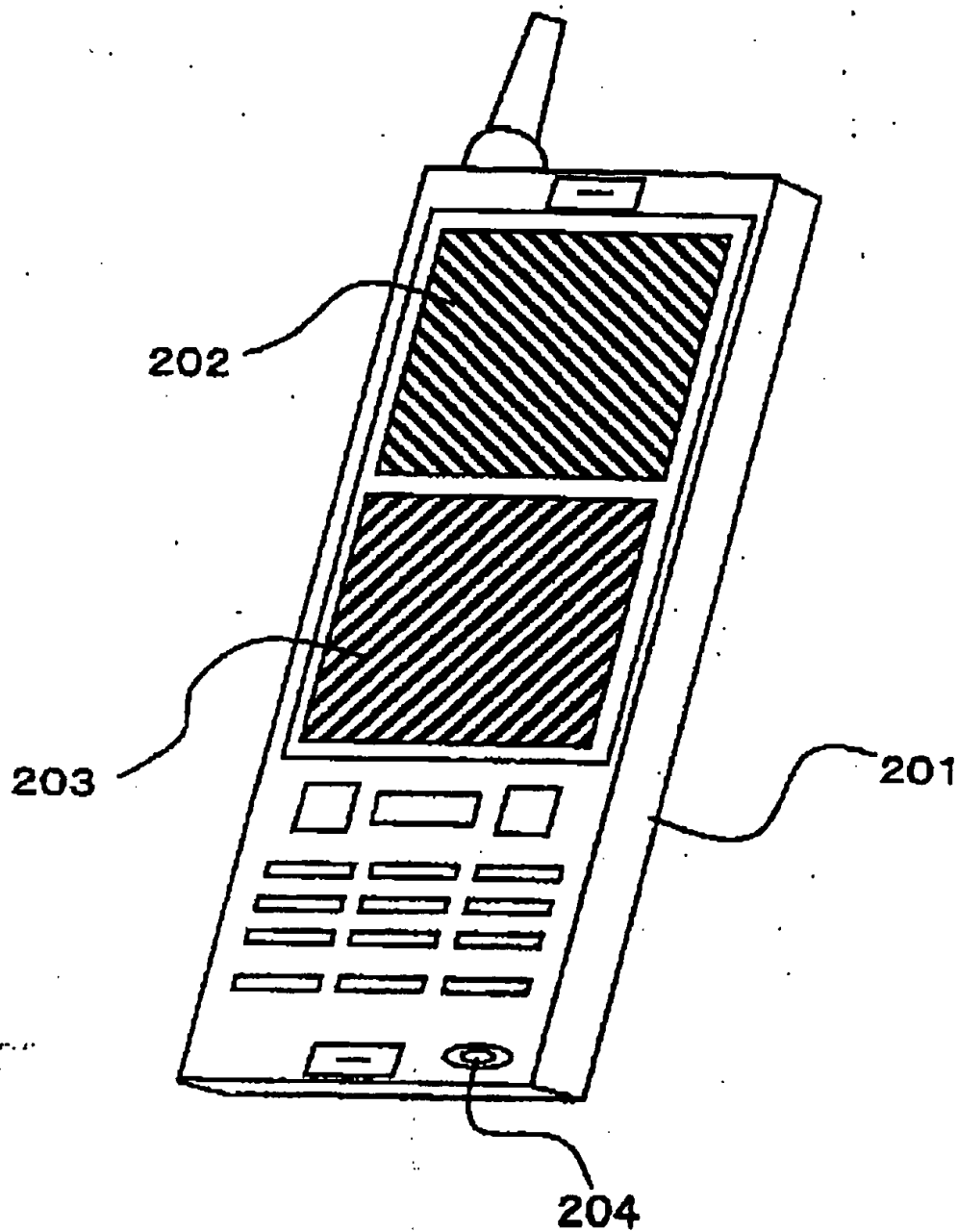




FIG. 4

